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U.S. ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND
Armament Research, Development and Engineering Center
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Mr. Sebasto has more than twenty years of service with the Federal Government in a variety of research, development and production positions at TACOM-ARDEC.

Mr. Sebasto is currently the Acting Associate for Technology, Fire Support Armament Center, at U.S. Army TACOM-ARDEC. In this position, he is responsible for the development and management of Center-wide technology base programs spanning the Fire Support mission area to include artillery, mortars, and fire control.

Most recent assignments include Acting ARDEC Associate Technical Director for System Concepts and Technology, Associate for Technology in the Close Combat Armaments Center, and System Manager for the Direct Fire Lethality Program.

Mr. Sebasto is a graduate of the University of Delaware with a Bachelor of Science Degree in Mechanical Engineering, and received a Master of Science Degree in Management from the Florida Institute of Technology.

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ARDEC Tech Base

Presented to

NDIA Armaments for Full Spectrum Warfare Conference

Mr. Anthony J. Sebasto
Acting Associate for Technology
Fire Support Armaments Center

25 June 2003

Transformational Lethality

Diverse Suite of Weapon Systems to <u>FINISH DECISIVELY</u>!

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Lethality Challenges

- ALL Engagement Scenarios – LOS/BLOS/NLOS
- ALL Environments – Day/Night
- First Round Kills
- Target Detection/Recognition – Advanced Targets
- Command, Control, Communications – Networked Fires
- Increased Range - Standoff
- Maximize Stowed Kills – Minimize Size, Weight
- High Performance, Low Vulnerability Energetics
- Rapid Rearm

Affordable Overwhelming Lethality

Major Lethality Technology Investments

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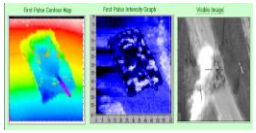
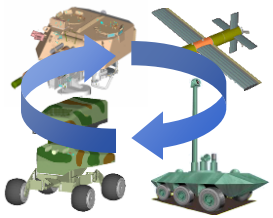


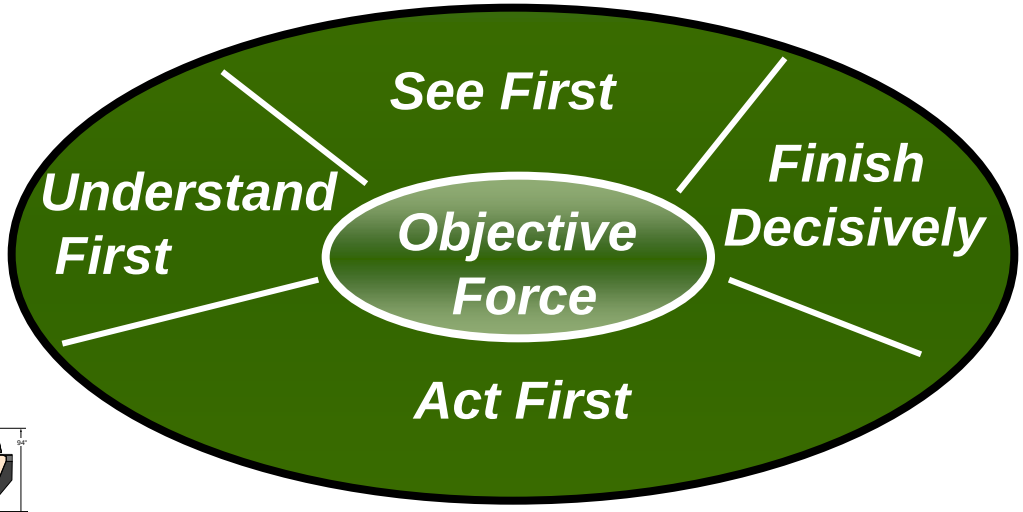
LADAR Sensors
F/ Smart Munitions

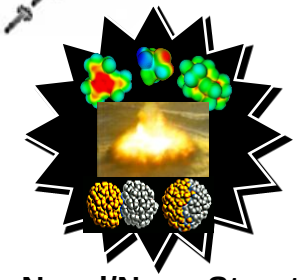
Acoustic/Seismic
Sensors

Multi-Mode
Warheads

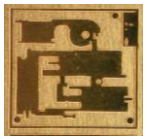


Commander's
Decision Aids

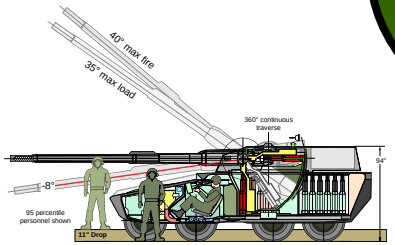




Novel/Nano-Structured
Energetics



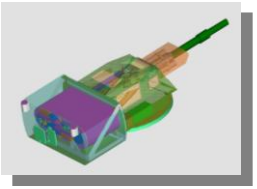
MEMS
S&A
(OICW)



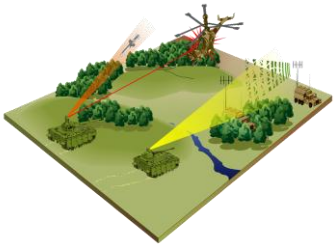
FCS 120mm
LOS/BLOS ATD

MEMS IMU

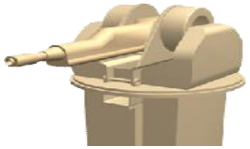
Mid-Range
Munition



NLOS-M Objective
Cannon



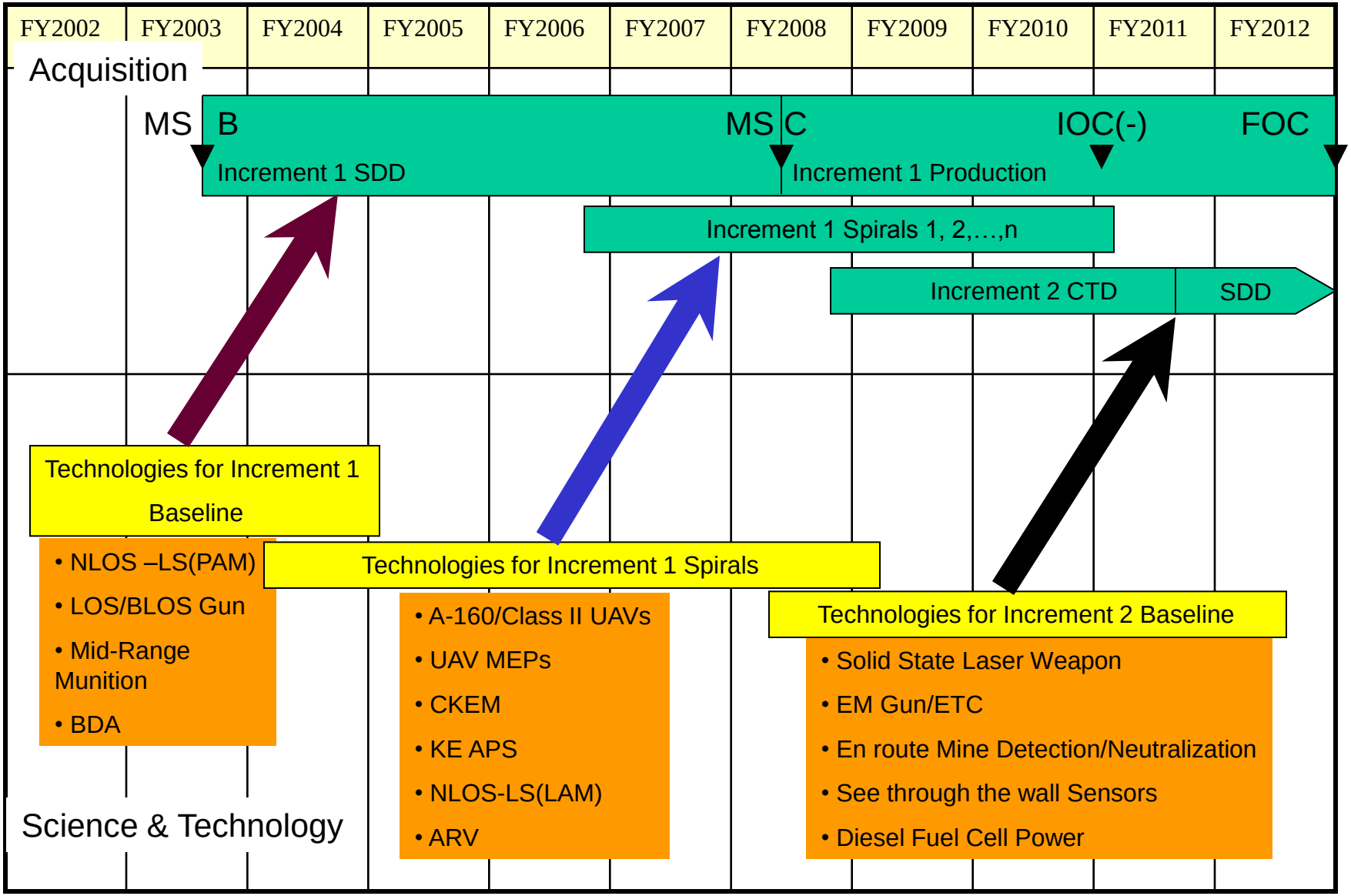
Agile Target Effects



Objective Crew
Served Weapon

LtWt Machine
Gun & Ammo

S & T Strategy for FCS Spiral Development



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XM307 OBJECTIVE CREW SERVED WEAPON
Increment I Capability

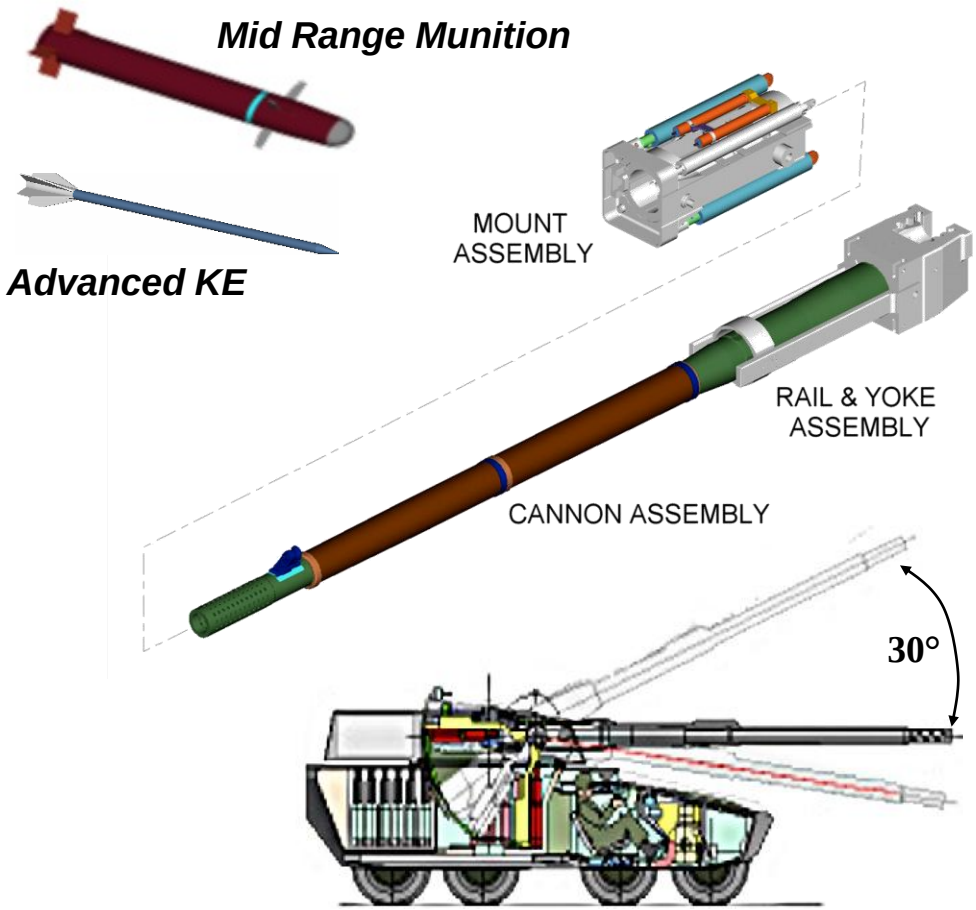
Objective: **Provides the mounted & dismounted warfighter a crew served weapon system *one third the weight of M2 & MK19 MGs, with overwhelming lethality* capable of defeating protected, defilade targets & light armor out to 2000m.**

- **LtWt, 2-man Portable (50.3 lbs)**
- **25mm Air-bursting Munitions**
  - **Defeats Defilade Targets**
- **Armor Piercing Munitions**
  - **Defeats Lt Armored Vehicles**
- **Day/Night/All Weather Capable**
- **3 system integration demonstrations completed**
- **TRL 6 April 03**
- **May 03 Transition to PEO Soldier**

Shoots/Handles/Maintains Like A Light Machine Gun

FCS 120mm LOS/BLOS System ATD Increment I Capability

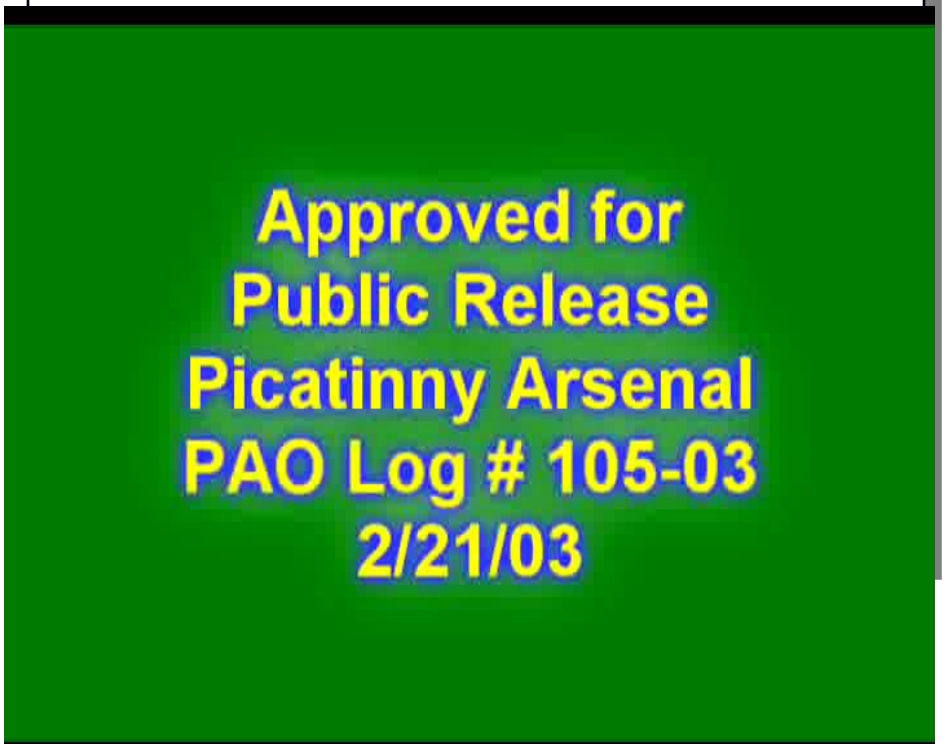
Objective: Demonstrate 120mm Line-of-sight (LOS) and beyond line-of-sight (BLOS) armament system components and ammunition suite for Mounted Combat System (MCS)

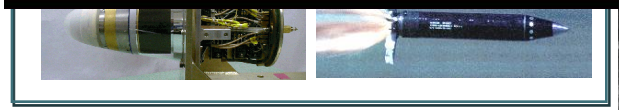


- Robust LOS/BLOS Lethality 0-12km
- Criticial technologies:
  - Ltwt (<4400lb), reduced impulse cannon
  - Advanced Kinetic Energy Munition
  - Mid Range Munition
  - Fire Control
  - Ammunition Handling
  - Electrothermal ignition
- Cannon design underway
- PM-Lethality sponsored TRL 5 Dynamic Response cannon demonstrator critical enabler to ATD success
- All components TRL 6 end FY04 (1Qtr04 for MRM)

Mid Range Munition (MRM)
Increment I Capability

Objective: Provide Mobile Combat System with a 120mm precision munition capable of defeating advanced high valued targets out to 8km and beyond.





Critical Enabler for Force Lethality and Survivability

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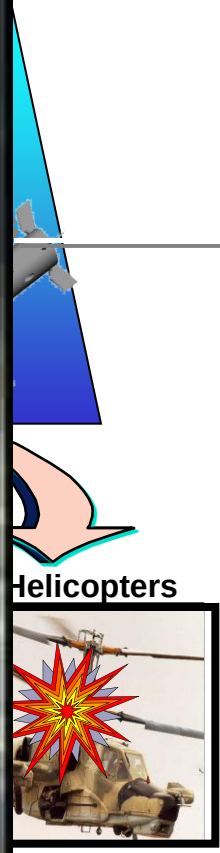
Multi-Purpose Warheads

Increment I and Spiral Capabilities

- Develo
  techno
  - *Shape*
    - 50% sh
    - Equal
    - Multi-M
  - *EFP wa*
    - >50% p
    - Multi-m
  - Multi-P
- Suppo
  - Maxim
    agains
    classe
  - Enabl
    addre



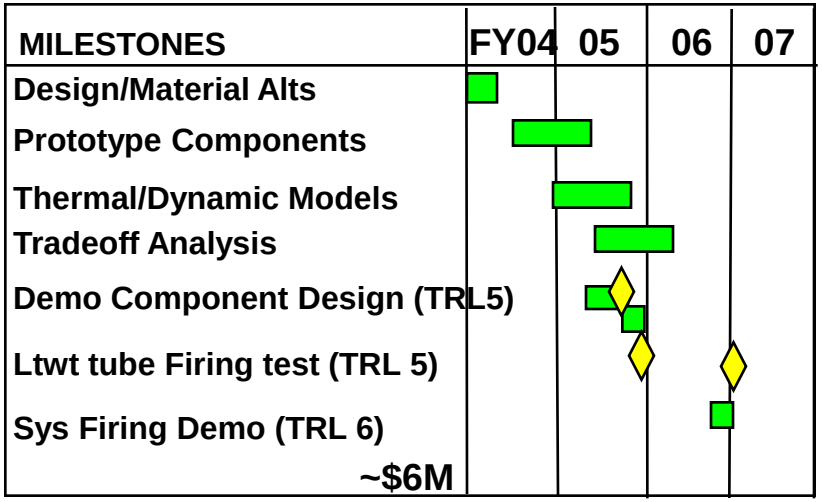
Increased lethality over a broader spectrum of targets

Lightweight Dismounted Mortar Weapon

Increment I Spiral Capabilities

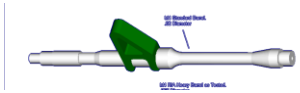
- 30 to 40% lighter weapon system
- Improve transportability and logistics
- Critical Technology:
  - Advanced metal matrix and composite materials
- TRL 6 demo FY06 with up to 30% reduced weight
- TRL 5 demo FY06 for advanced gun tube to enable up to 40% reduced weight in SDD
- Transition to PM-CAS FY07

Schedule



Lightweight Machine Gun and Ammunition

Increment I Spiral



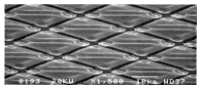
Ceramic Barrel

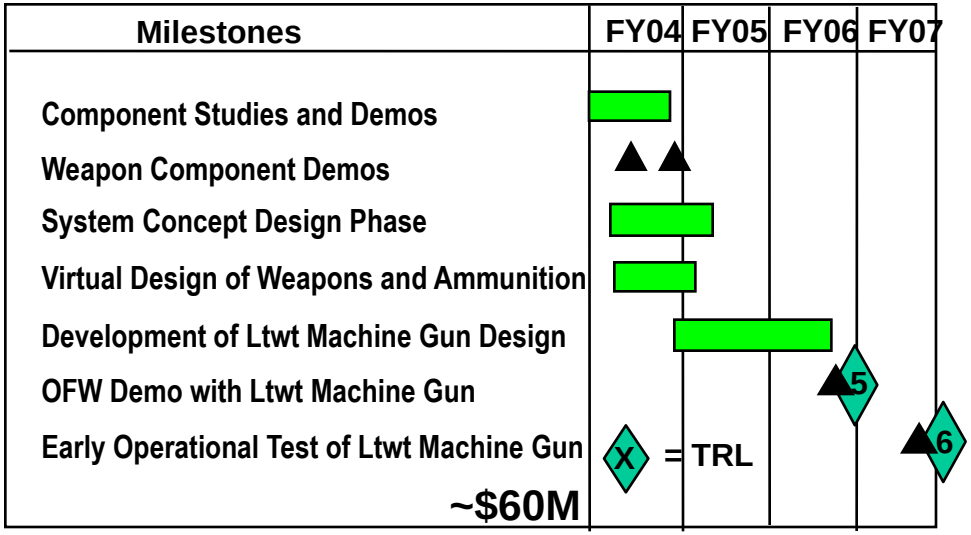
Caseless or Plastic Cased Ammunition

Embedded Sensors

Simple Reliable Mechanisms

Composite Structures





- Equivalent capability of current light machine gun at 20%-35% lower weight.
  - "Clean sheet of paper" approach
- Increased mobility and maneuverability, reduced training and maintenance
- Critical Technologies:
  - Lightweight materials
  - Recoil Management
  - Thermal management
  - Caseless ammunition
- TRL 6 in FY07 prototype live fire testing
- Transition to PM Soldier Weapons for SDD

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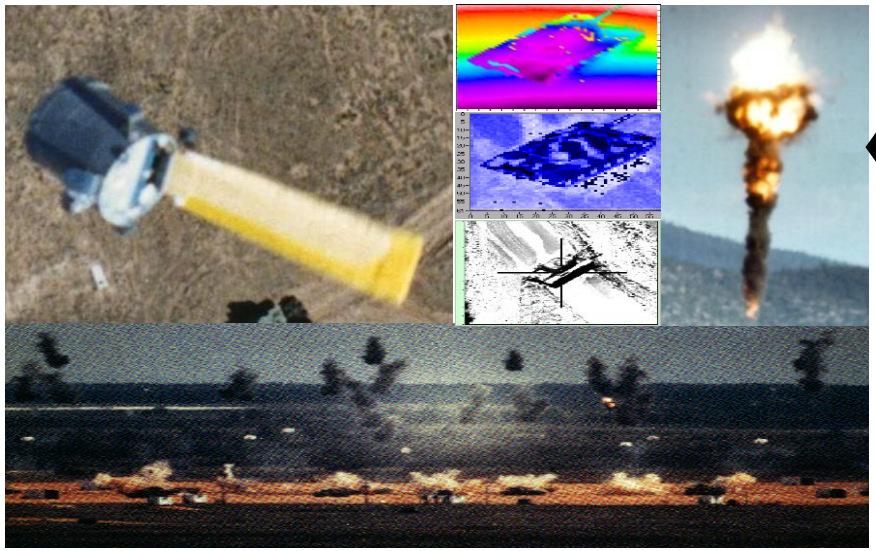
Common Smart Submunition

Increment I Spiral Capability



MILESTONES	FY04	FY05	FY06	FY07	FY08	FY09
Concept Analysis/M&S						
Modular S&A						
Decel/Scan System						
Lethal Mechanism						
Warhead Tests		3	4	5		
Sensor Suite						
Sensor Tests		3	4	5		
G Hard/Pack/Intgr/Test						6
~$47M						

- *Full function submunition for multiple platforms including guns, missiles, and aerial dispensers.*
- *Application to 120mm and greater*
- *Takes advantage of future, more accurate delivery systems*
- *Affordability based on design and economy of scale.*
- *Critical Technologies:*
  - *Combined Effects EFP Warhead*
  - *Multi-mode Sensor*
- *TRL 6 demonstration FY08*

Future Intelligent Munition (FIM)

Increment I Spiral Capability

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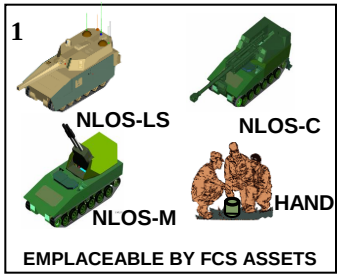
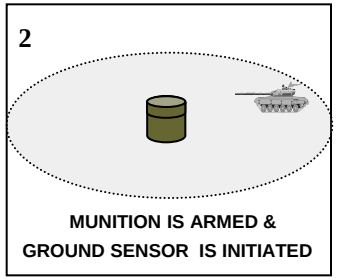
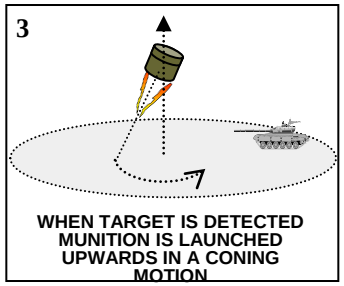
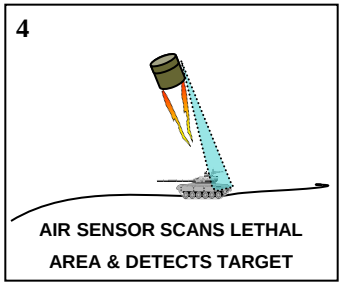
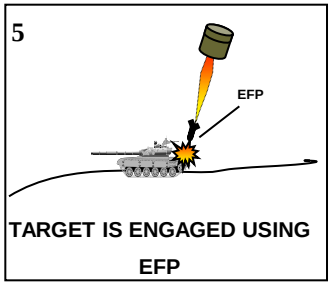








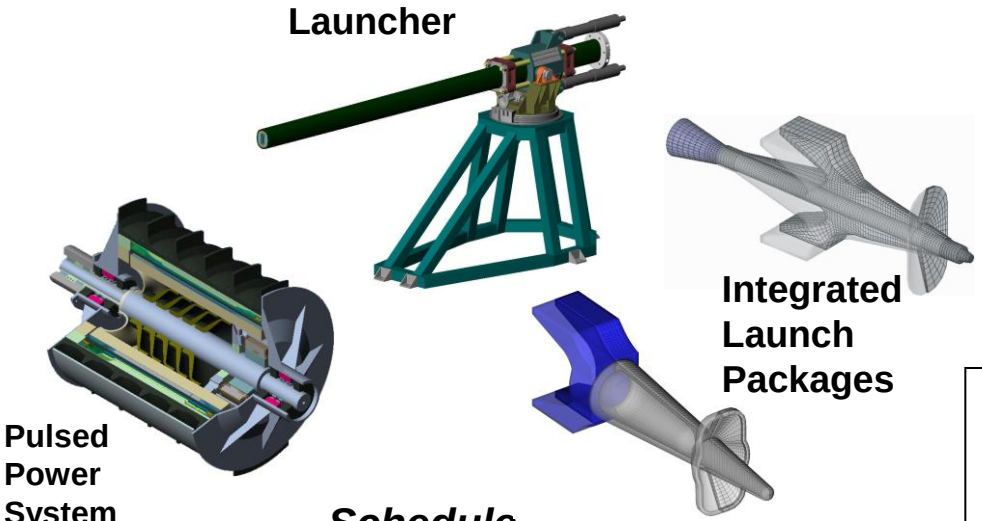


MILESTONES	FY04	FY05	FY06	FY07	FY08	FY09
Sys. Simulations & Refinement						
Ground Sensor Development			4	5		
Air Sensor Development			4	5		
Propulsion/Stabilization System			4	5		
Critical Component Hardening & Testing						
Virtual System Integration						
Integrated Demo					6	
Total Army $19.8M						

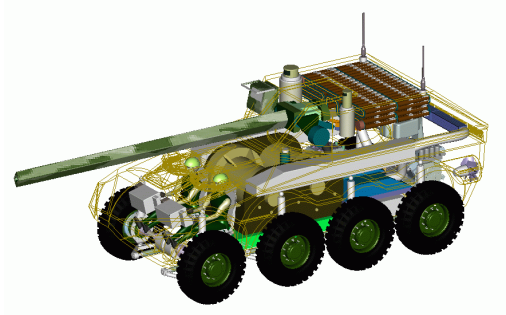
- **Smart Scatterable Area Denial Munition**
- **Provides remote emplacement at tactical distances from FCS platforms**
- **70% Fewer Munitions per barrier vs FASCAM**
- **Critical Technologies:**
  - **Combined Effects Warhead (Common warhead with CSS)**
  - **Target Acquisition Sensors**
- **Demo G-survivability for function**
- **TRL 6 Field Demo in FY08**

EM Gun Technology Maturation & Demonstration

Increment II Capability



System Concepts & Trade Studies



Schedule

MILESTONES	FY04	FY05	FY06
Pulsed Power Supply			
Materials		4	5
Thermal Mgmt			5
Full-scale PPS			
Launcher			
Materials	4		4
Full-scale launcher		4	5
Launch Packages			
LOS		4	5
NLOS/BLOS		3	4
System Concept/M&S			
~$90M			

- Mature/demonstrate major subsystem performance characteristics at or near full scale
  - Pulsed Power System
  - Launcher
  - Integrated Lanuch Packages
- Demonstrate utility of hypervelocity for armor defeat
- Demonstrate HE/electronics launchability
- Mission area trade study to determine best system application for potential follow-on ATD beginning FY07
- Collaboration with Navy in-process

Modeling Architecture for Technology and Research Experimentation

(ARDEC Contribution)

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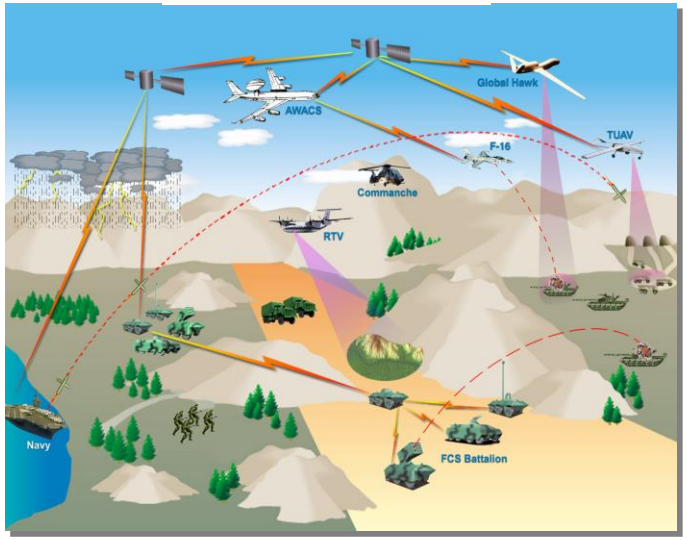
MATREX



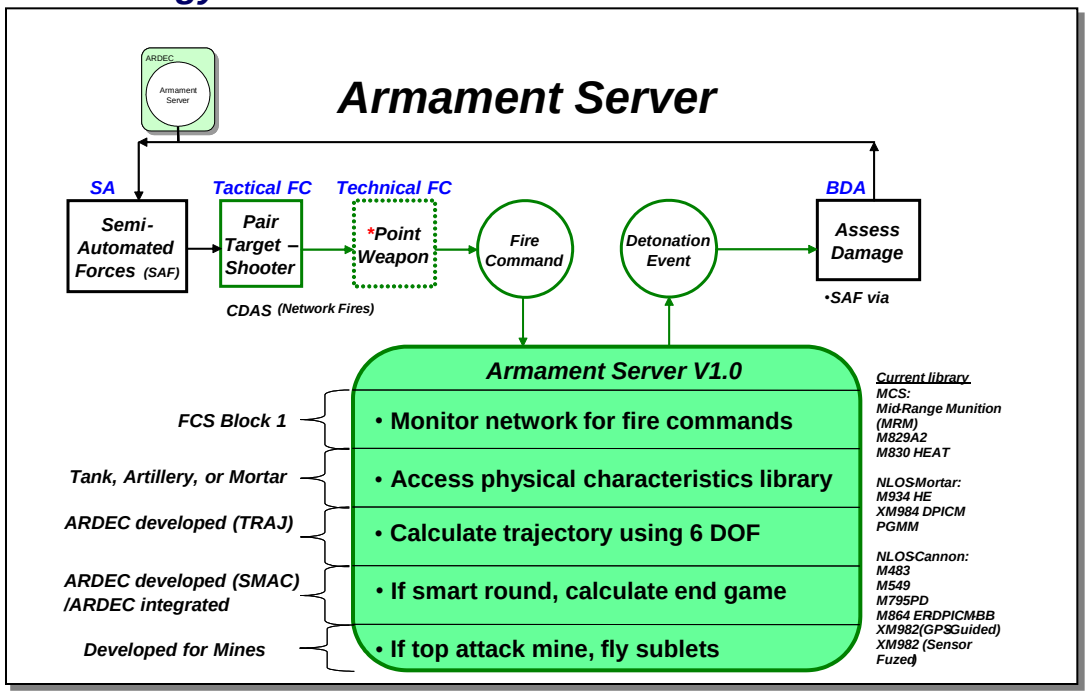
Objective: Provide persistent, distributed simulation environment for evaluation of Future Combat Systems and Objective Force concepts

Product:

- ***Full spectrum capability for SMART***
- ***Realistic engineering representation of systems and environments***
- ***Reusable environment where sub-system models can be integrated into an established architecture for analysis & technology trades***

MATREX Schedule

Tasks	FY03	FY04	FY05	FY06	FY07
▪ Architecture design and development					
▪ Enhance and evolve architecture					
▪ Support FCS C4ISR experiment					
▪ Support LSI Capstone Demo					
▪ Conduct 1st App Baseline					
▪ Demonstrate engineering models for use by TRADOC, ATEC and LSI					
▪ Architecture releases with documentation		v0.5	v1.0	v2.0	v3.0



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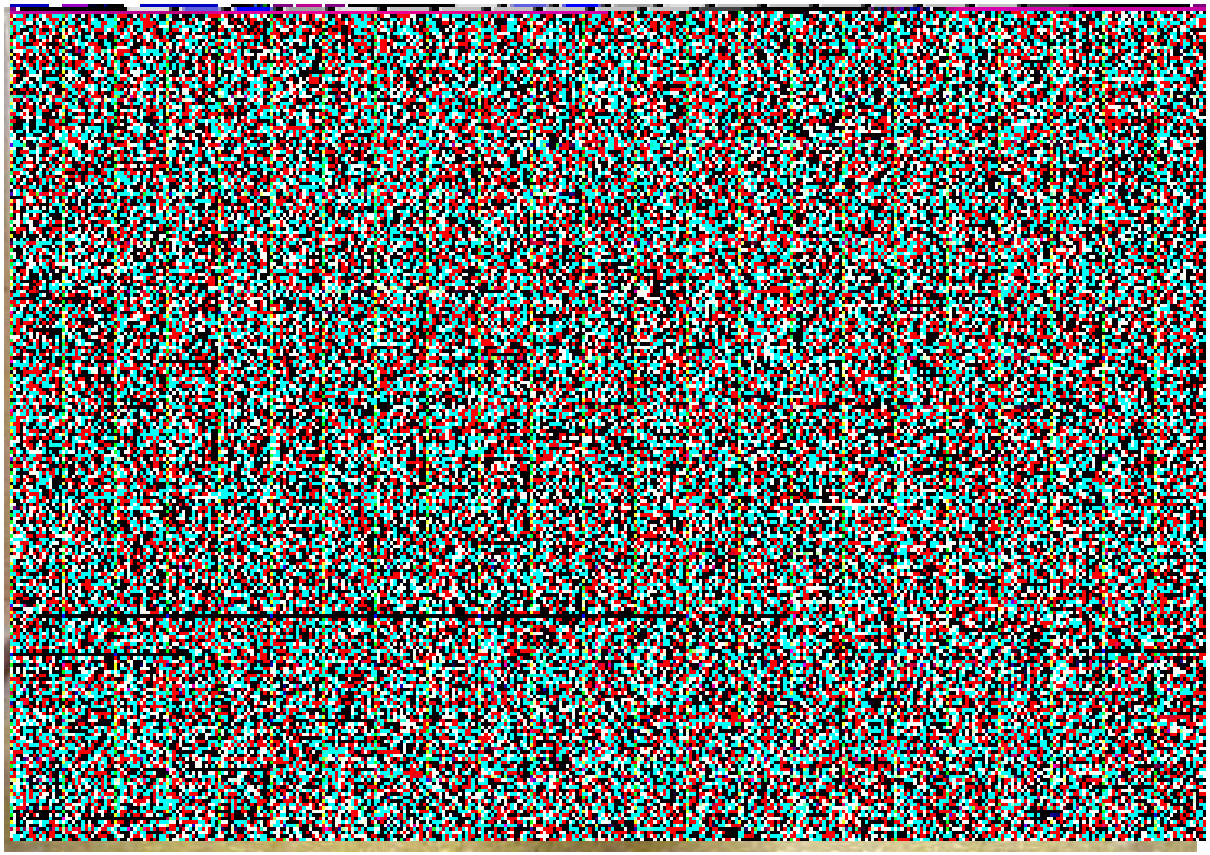
Armed UGV



- **Rapid Demonstration Program**
- **Explore Armament Integration Issues on Small, Lower Cost UGV**
- **Support Customer Demonstrations**

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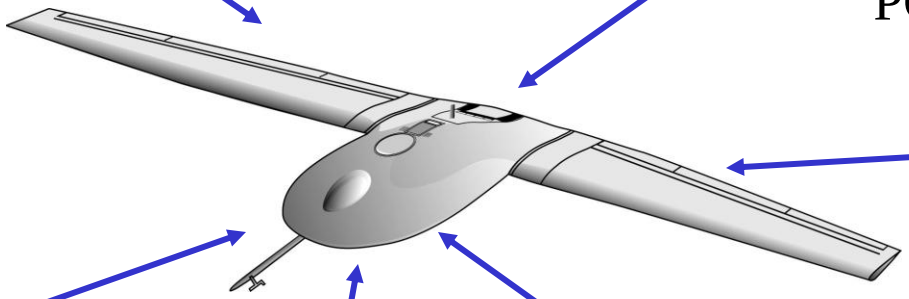
Armed UAV Payloads

OCSW

Integration Study in process

Smart Top-Attack Submunition

Demo planned 2Q04

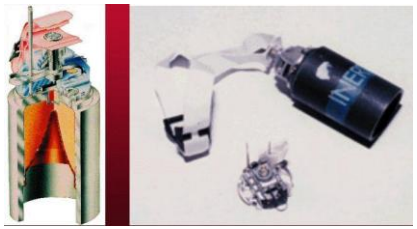


PGMM (Mod), MRM, etc

Area Denial Sublet

- HE/WHD
- Directed Energy
- Non-lethal

DPICMs



LtWt Payloads Enabling Smaller, Lower Cost Armed UAV's

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Summary

- Key Lethality Technologies Maturing for Increment I Transition and Follow-on Spiral Insertions.
- Key Focus Areas:
  - Affordable Smart Munitions
  - Lighter Weapons/Ammo for Dismounted
- Strong Presence in Distributed Collaborative Environment Through the Armament Server
- Growing Emphasis on Armament Integration on Unmanned Ground/Air Platforms